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On April 17th.—J. Russel. Steering ships and boats, which can also be used for propelling them, and for other purposes.—W. R. Lake. Manufacture of iron and steel (com.)—H. Collet and J. B. Denans. Apparatus for regulating the flow of liquids.—A. Bullows. Manufacture of buckles, rings, and other like metallic articles.

Harness Clamp.—James McCormick, of Glidden, Iowa, has invented rubber-faced metal plates for attachment to the jaws of harness makers' sewing clamps, to hold the leather to be sewn without injury to it, and, at the same, firmly. The said plates are constructed with a groove in the face side, which receives the rubber facing, and holds it without other fastenings.

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AUGUST 1, 1876.

OUR NAVAL FAILURES.

"Too many cooks spoil the broth" is an old aphorism, the point of which is not confined to the kitchen, as anyone who has had experience of life will find no difficulty in admitting; and without question it will apply with full force to the naval affairs of this country, for after that terrible disaster, the loss of the Captain, with her crew of 500 men, of the Vanguard, whose boasted watertight compartments did not save her from sinking when pierced by the ram of a friendly vessel; and now the slaughter of a large number of the crew of the Thunderer by the bursting of a boiler, one cannot help thinking that our Admiralty system of departmentising—and departmentising, by which in reality a number of distinct and independent powers are called into play—must be the real source of the evil, whatever the inquest or any inquiry-court may decide upon as being the proximate cause of the catastrophe. We cannot believe that these accidents have occurred through any want of science or technical ability, for surely these are at the command of the Government.

Such disasters may sometimes, it is true, arise from want of discipline, though this assumption is, in the case of the Thunderer, negatived by the fact which has been publicly stated that when Mr. Weeks, one of the engineers of the Thunderer, acting on the presumption that a cylinder had given way, stopped the engines, closed the stop-valves, and then groped through the dense fog of steam to the upper deck, calling, in God's name, for volunteers to go below and bring the dead and dying out of he stokeholes, it was but natural that many of the landsmen and dockyard hands who heard this appeal should have been too terrified and too bewildered to respond to it; for they knew nothing about the construction of the ship, and would probably have been able to render but little service had they ventured below. Yet the influence of discipline was, however, speedily and nobly displayed; and a number of the regular crew of the Thunderer, blue jackets as well as engine room artificers, hastened to follow their officers to the stokehole and afford the desired assistance.

It is much more likely that too much discipline, like the excessive departmentising we have referred to, may have had something to do with the matter, for punctilious waiting for commands from a superior officer in dealing with steam-engine casualties would account for any amount of calamity. Everybody who knows anything of the matter knows very well that the Royal Navy seldom errs in keeping up too little discipline. The love for so much of it on shipboard is just the very thing to keep out of the naval service the best of our working engineers; so that, like many another department of the public service, the naval engineering branch, is, save in a few exceptional instances, served by decent mediocrities.

Independently of the investigation of the cause of the terrible casualties another consideration arises, which goes to the root of the matter, and that is whether these iron-armoured monsters can ever be made to have that stability and mobility they ought to have when sent forth to encounter the power of the winds and waves on the ocean; and hence whether their construction is not a mistake? At present our naval constructors have arrived at this point.—Like Frankenstein, they have evoked malignant beings that defy and destroy their creators.

To our mind the matter stands thus: Big ships *versus* big guns, and we incline to the belief that big guns, if efficiently served, will beat; who that gives any intelligent thought to the matter will not see that in land warfare, good artillery, and ably-planned and well-executed earthworks are better than the most elaborated system of stone work fortification? So at sea such a sized vessel as can be properly handled, so far armoured as due regard thereto may permit, and with first rate artillery power, seems to our mind the *ne plus ultra* of a war vessel.

These are considerations of such national importance that we hope they will receive the attention they deserve. At the same time that the strictest investigation is made into the immediate cause of this fearful occurence whereby a number of stokers have been literally boiled to death in the escaping steam, and a large number of others scorched, scalded, and bruised in a fearful manner. Altogether, about seventy-seven persons were either killed or seriously wounded, and at least forty of them must already be reckoned amongst the dead, while many other cases are in a hopeless state. The ship, which cost about £300,000, is of course disabled, and probably rendered unfit for active service for some months to come. And such a loss of gallant men, most of them in the full vigour of youth and manhood, the English nation will most deeply deplore; the more so as they have been lost, not in the necessary although cruel struggle against their country's enemies, but, as it is greatly to be feared, simply because "some one has blundered." It is to be hoped that the inquiry now being held will bring out all that can be brought out of the facts of the case, and that from the dearly-bought experience of the event lessons will be learned which will tend to greater security in the future, and the greater efficiency of our naval armaments.

Proceedings of Societies.

ROYAL INSTITUTION.

JULY 3RD.—Sir T. F. Elliot, V.P., in the chair.—The Rev. J. E. Pryor, Messrs. C. De Candolle, L. Lœffler, C. Heneage, W. S. Smith, and J. L. Walker were elected members.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

JUNE 6TH.—Dr. S. Birch, President, in the chair.--The paper read was, "Chronological Remarks on the History of Esther and Ahasuerus or Atossa and Tanu-Axares," by Mr. J. W. Bosanquet.

July 4th.—Dr. S. Birch, President, in the chair.—The following candidates were elected Members: Rev. Canon Collins, Rev. E. Lawson, Rev. T. Paley, and W. H. Rylands. The following papers were then read: "Notes on Cypriote Palæography," by D. Pierides (Larnaca). This paper consisted of three communications to the President of the Society, describing nine different Cypriote inscriptions which had been discovered during the recent excavations of General di Cesnola.—"Notes on Assyrian Religion and Mythology," by W. St. Chad Boscawen.

ANTHROPOLOGICAL INSTITUTE.

JUNE 29TH.—Col. A. Lane Fox, President, in the chair.—The election of two new Members was announced.—Mr. Walhouse exhibited arrow-heads from Southern India, closely resembling forms met with by Lieut. Cameron in Central Africa.—Remains of red-deer, wolf, with portions of a human skull, from the foundation of the Bath Gasworks, were exhibited by Miss A. W. Buckland.—Mr. Hyde Clarke read a paper, "On Serpent and Siva Worship and Mythology, in America, Africa, and Asia." The first part of the paper was devoted to an account of the Bribri and other Indians of Costa Rica in Central America, and of the immediate relations of their languages to those of Western Africa. This furnishes another connexion of language, besides the Carib with the Dahomey, the Guarani with the Agau and Abkhass, and the Quichua, Aymara, and Maya with Accad and Cambodian. The rest of the paper was devoted to tracing the Central-American one god, Sibu, and his mythology to the old world. This word, as Sowo and Nebo, is in company found with Kali in West and Central Africa, over a wide area, representing god, spirit, idol, naval, &c. It was then illustrated with Siva and Kali, and the cosmogony and serpent worsip in India ? and further with Nebo in Babylonia, Seb in Egypt, Seba in Arabia and Phrygia. The title Sabaoth was referred to. The American legend appeared to point to a unity of God in the prehistoric epoch.—Mr. P. Harrison described marks found, last summer, on the chalk at Cissbury—some upon the walls of the galleries, and the remainder on rounded pieces of chalk.—Dr. Gillespie read a short note, "On the Use of Flint Cores as Tools."—The remaining papers were: "On the term Mediterranean, as applied to a Part of the Human Race,"--and "A minute Account of the Javanese," by Mr. Kiehl.

PHYSICAL SOCIETY.

JUNE 24TH.—Prof. G. C. Foster, President, in the chair.—The following candidates were elected Members: Prof. J. Dewar and the Hon. F. A. R. Russell.—Prof. Guthrie showed the action of Prof. Mach's apparatus for exhibiting to an audience the effect of lenses on a beam of light passed through them.—Baron Wrangell exhibited the apparatus employed by Petrochovsky in his magnetic experiments. These experiments had reference to (1) Normal magnetization; (2) The measurement of the distance of the poles of a magnet from its ends; and (3) A thermoelectric apparatus.—Prof. Barrett made a brief communication "On the Magnetization of Cobalt and Nickel."—He has recently made some experiments on these metals, with a view to ascertain whether they undergo any elongation or contraction similar to that experienced by iron during magnetization. From his first experiments he concluded that cobalt elongates slightly, but that there is no effect on nickel, but this latter result may have been due to the fact that the metal was not absolutely pure. He has, however, obtained, through Mr. Gore, a fine bar of pure nickel, about two feet in length, and now finds that it contracts, and that the amount of its contraction is about the same as the expansion of a like iron bar when similarly treated.—Prof. Guthrie described some experiments on the freezing of aqueous solutions of colloid substances which he has been studying in connexion with his recent investigations on cryohydrates, &c. If a solution of sugar be gradually cooled, the temperature at which ice separates out is always below 0° C., and the extent below increases with the amount of sugar in solution, But he finds that in a solution of gum having exactly the same chemical formula, the ice always separates at 0° C., whatever be the amount of gum present. Thus, while every crystalline substance forms a freezing mixture when mixed with ice or snow, colloids are incapable of doing so. The gum and the water do not recognize each other; and similar results were obtained in the case of gelatine and albumen. These facts are strictly in accordance with the results of Prof. Graham's classical researches. It almost follows that when heated similar effects are observed, and Prof. Guthrie has found that solutions of gum in varying proportions always boil at 100° C.

STATISTICAL SOCIETY.

JUNE 27TH.—*Annual Meeting.*—The President, J. Heywood, Esq,, F.R.S., in the chair.—The report read showed that the Society continues to advance steadily in numbers and in public estimation. The Howard Medal of 1875 was awarded to Mr. E. Smith, for his essay "On the State of the Dwellings of the Poor in the Rural Districts of England." Mr. Heywood has added £20 to the medal for the present year (1876), the subject of the essay being "The Mortality of Hospitals," and he has promised to add £20 to the medal for 1877, the subject being "The Condition and Management, Past and Present, of the Workhouses and similar Pauper Institutions in Eng-England and Wales, and their Effect on the Health, Intelligence, and Morals of the Inmates." The President, Council, and Officers for the ensuing year, as proposed to the Meeting, were unanimously elected: President, Mr. J. Heywood; new Members of the Council, Mr. R. Baxter, Lord Borthwick, Mr. S. Bourne, Mr. J. Cleghorn, Mr. R. Giffin, and Sir R. W. Rawson; Secretary, Mr. R. Giffin, in the place of Dr. Mouat. The rules of the Society were slightly altered to permit the latter to remain as Foreign Secretary. The following Fellows were nominated as Delegates to the International Statistical Congress, to be held at Buda Pest in September next: Dr. F. J. Mouat, Profs. Leoni Levi and Hodgson, Messrs. H, Chubb, W. Tayler, F. Hendriks, E. Seyd, J. Cleghorn, and C. W. Copperthwaite.

LINNEAN SOCIETY.

JUNE 15TH.—Prof. Allman, President, in the chair. Prof. Rolleston, in a paper "On the Prehistoric Pig of Britain," arrives at the following conclusions: (1) The domesticated pig of pre-Roman times he refers to the wild variety of *Sus scrofa;* (2) the Indian wild hog, *S. cristatus*, differs mainly by the retention of structural conformations which were only temporarily represented in the European wild species; (3) taking the changes which domestication produces into account, the *S. indicus* he conceives to be a modified *S. cristatus*, and not derived from *S. leucomystax* or other species; (4) the skull of a wild sow, from the alluvium at Oxford, possesses such a combination of characters as to cause the author to hesitate in accepting the Torf-Schwein, *S. scrofa*, var. *palustris* of Rütimeyer, as a distinct species; (5) simplicity of third molars in a large skull of the Bornean pig, *S. barbatus*, in his eyes, has value; (6) the *S. verrucosus*, in his tear and cheek bones, differs from the *S. barbatus*, and these peculiarities obtained in the old Irish "Greyhound" pig figured by Richardson.—Dr. M. Masters, in "Remarks on the 'Superposed' Arrangement of the Parts of the Flower," discussed a number of difficult problems in connexion with development. Real superposition, he considers, may arise from (*a*) superposition of whorls; (*b*) spiral arrangement of parts; (*c*) enation and chorisis; (*d*) abortion; (*e*) pleiomery; (*f*) substitution of one organ for for another; (*g*) torsion of the axis. Examples of the above were cited, and illustrations given of the relative position of the perianth and andrœcium in the Tilliacea and Olacaceæ. Mr. Archer read a paper on the genus Ballia, based on specimens obtained from Kerguelen land. Septa separating the cells have "pits" which closed by peculiar "stoppers," the use of which is conjectural. To the origin of the cortical investment of the converfoid filaments, the development of the branches, and to the manner in which the cells of the rachis are jointed together the author made reference.—Dr. J. Anderson, from the study of the feathering and skeleton of the Spoon-billed Sandpiper of India, shows that, save in peculiarities of bill, it agrees with our European genus Tringa.—A collection of birds from South-East New Guinea, obtained by the Rev. A. M'Farlane, were shown and commented on by Mr. R. B. Sharpe. A Bird of Paradise (sp. ?) and *Graucalus Angustifrons* are new.—A joint communication, by Prof. Duncan and Major-General Nelson, "On some Points in the Histology of Certain Species of the Corallinaceæ," was orally summarized by the former. The Lithophytes or Corallines studied have been those of Bermuda and our own shores. In our colder climate their abortive dimensions and relative absence of colouring detract from the interest attached to their exterior, and to a certain extent have interfered with observations on peculiarities of their structure. A stony like mass when out of the water, those of Bermuda when alive and in the sea present a remarkable long filamentous brush on their surfaces. The fine hairs penetrate the surface, which latter the authors show is composed of a loose cellular tissue, at intervals separated by spaces from the central more compact interior substance. The inner material is also composed of cells and certain fibres, modified at the joints; and the deposition of carbonate of lime takes place originally in the epiderm, ultimately filling deep cells and interspaces. Certain physiological inferences are drawn by the authors from the above and other data given.—Mr. S. H. Vines read a paper "On the Nature of the Digestive Ferment of the Pitcher Plant (Nepenthes)"; and the following communications, chiefly of a technical character, were taken as read:—"Notes on a Lomaria from the Malvern District, Canterbury, New Zealand," and "Habits of Ferns on the Rakaia River, New Zealand," by Mr. J. H. Potts,—three short papers by Prof. Dickie, "On Algæ collected by Mr. Moseley, of the Challenger Expedition,"—"Additional Note relative to the Norwegian Lemming," by Mr. W. Duppa Crotch,—"A Revision of the Oxystomatous Crustacea," by Mr. E. J. Miers, in which a number of new species are described and figured,—"Some of the Freshwater Algæ of Kerguelen Land, from the Challenger Expedition," by Mr. W.

Archer,—and "Fungi of the Island of Rodriguez," by the Rev. J. M. Crombie.

ZOOLOGICAL SOCIETY.

JUNE 20TH.—Prof. Flower, V.P., in the chair.—Letters and papers were read from M. L. M. D'Albertis and Dr. G. Bennett, respecting M. D'Albertis's proposed new expedition up the Fly River, New Guinea, (a small collection of Bird-skins made at Yule Island, and on the adjoining coast of New Guinea by the last-named naturalist was shown),—from Commander W. E. Cookson, respecting the large Tortoises from the Galapagos Islands (the living specimens had been obtained in Albermile Island, those obtained in Abingdon Island having died before reaching this country),—by Mr. G. E. Dobson, "On Peculiar Structures in the Feet of Certain Species of Mammals," by which they are enabled to walk on smooth perpendicular surfaces, especially alluding to Hyrax and the Bats of the genus Thyroptera,—from Dr. J. S, Bowerbank, the sixth part of his monograph of the Silicio-fibrous Sponges,—from the Rev. O. P. Cambridge, a catalogue of a collection of Spiders made in Egypt, with descriptions of new species and characters of a new genus,—from Mr. W. T. Blanford, "On the Views of A. Von Pelzeln as to the connexion of the Faunas of India and Africa, and on the Mammalian Fauna of Tibet, and on some of the specific identifications in Dr. Günther's secondReport on collections of Indian Reptiles obtained by the British Museum."—By Mr. H. Saunders, "On the Sterninæ, or Terns," with descriptions of three new species, which he proposed to cal *Sterna Tibetana*, *Sterna eurygnatha*, and *Gygis microrhyncha*,—by Dr. Cunningham, on a young specimen of a Dolphin, caught off Great Grimsby, in September, 1875: after pointing out the great difficulty experienced in referring it to its proper place amongst the dolphins—this difficulty arising chiefly from the unsatisfactory descriptions which have been given in this country by former observers—he came to the conclusion that he was justified in referring it to *Delphinus albirostris*, the differences being, in his opinion, merely those of age,—by Mr. J. W. Clark, "On a Dolphin lately taken off the Coast of Norfolk," which he referred to the same species,—from Mr. R. B. Sharpe, on an apparently new species of Owl from the Solomon Islands, which he proposed to call *Ninox Solomonis*,—by Mr. A. H. Garrod, "On the Anatomy of certain Parrots,"—by Mr. H. E. Dresser, "On a New Species of Broad-billed Sandpiper, from North-Eastern Asia," to which he gave the name *Limicola sibirica*,—from M. Dresser, "On a New Species of *Tetraogallus*," discovered by Mr. Danford in the Cilician Taurus, which he proposed to call *T. Tauricus*,—by Dr. A. Günther, "On a small Collection of Animals brought by Lieut. L. Cameron from Angola,' —and from Lieut. R. W. Ramsay, on a fine new species of Nuthatch, from Karen-nee, which he proposed to call *Sitta Magna*.

ENTOMOLOGICAL SOCIETY.

JUNE 7TH.—Professor Westwood, President, in the chair.—Messrs. A. A. Berens, A. H. Swinton, and C. M. Wakefield were elected Members.—Mr. Douglas made some further remarks on the "Corozo Nuts," known as "Vegetable Ivory," exhibited by him at the last meeting, which were attacked by a beetle of the genus Caryoborus. The officials of the Dock Company were anxious to ascertain if there was any mode of arresting their depredations, and whether the beetles lived and bred among dried nuts or entered the kernel at an earlier stage. It was suggested that the mischief originated in the parent beetles laying their eggs in the nuts when still in a green or soft state, the metamorphosis taking place inside the nuts.—Mr. M'Lachlan, in connexion with the above, exhibited the nuts of a species of Caryoborus (*C. bactris*), forwarded to him by Professor Dyer. In this case every nut served as food for a single larva only, which bored in it a cyclindrical hole, of considerable size and depth, whereas the former nuts were infested with several larvæ in each nut.—The President exhibited the larva of an Australian species of Hepialus, from Queensland, bearing a singular fungus, with four or five branches, issuing from the back of the neck and the tail. Also a fungus growing out of the back of a Nactua pupa. —Mr. M'Lachlan, on behalf of Dr. Atherstone, of South Africa, exhibited a couple of very singular orthopterous insects (belonging to the Acrydiidæ), which in colour and in the granulated texture so exactly mimicked the sand of the district as to render it almost impossible to detect them when in a quiescent state. This insect was supposed to approach the *Trachyptera scutellaris*, Walker. Also, some very peculiar cases, one belonging to a beetle of the genus Paralichas (one of the Dascyllidæ), and another belonging to a species of Oiketicus. To the latter were attached a number of small angular pebbles, which added considerably to its weight.—The President read descriptions and exhibited drawings of two very singular forms of Coleoptera from Mr. Wallace's private collection. For the first, which belonged to the Telephoridæ, he proposed the generic name Astychina, remarkable for the form of the terminal joints of the antennæ in one sex, which were modified with what appeared to be a prehensile apparatus, differing from anything known in the insect world, but of which some analogous forms were found to occur among certain Entomostracous Crustacea. The other pertained to the Cleridæ, and was named Anisophyllus, differing from all known beetles by the extremely elongated branch of the ninth joint of the antennæ.—Mr. Smith read descriptions of new species of Hymenopterous insects from New Zealand, collected by Mr. C. M. Wakefield.—Mr. J. S. Baly communicated "Descriptions of New Genera and Species of Halticinæ."—Dr. Sharp communicated descriptions of a new genus and some new species of Staphylinidæ from Mexico and Central America, collected by Messrs. Salvin. Flohr, and Belt.

July 5th.—Prof. Westwood, President, in the chair.—Mr. Douglas exhibited some rare British Psyllidæ, taken by himself, near Lee, Kent; amongst which was *Aphalara renosa*, Forst, new to the British Fauna, now first identified as living on *Achillea millefolium*.—The President showed some microscopic slides containing specimens of Diptera, &c., prepared with extraordinary care ; by Mr. Enock. He also brought for exhibition twigs of horse-chestnut from Oxford, that had been attacked by some species of larva, which had eaten away the inside of portions of the stem, causing the buds to drop off. He was in doubt whether the insect was *Zeuzera æsculi*, or some other; but he would be glad to know if the destruction to the trees had been noticed elsewhere. He also exhibited two species of Coccus, one of them on camellia-leaves in his greenhouse, which he had previously described in the *Gardeners' Chronicle* under the name of *C. camelliæ* and which had afterwards been observed by Dr. Verloren in his greenhouse in Holland. The female, which is one line in length, discharges a white, waxy matter, having the appearance of the excrement of a young bird. The other species had been sent to him by the Rev. T. A. Preston, of Marlborough, on a species of Euphorbia obtained from Dr. Hooker, of Kew. The leaves were covered with small scales, which, on close examination, he observed to have two small filaments, attached, and these proved to be the caudal extremities of the males. These insects emerge from the pupa backwards, and, in consequence, they make their appearance with the wings drawn forward over the head.—Mr. Stevens exhibited varieties of some British Geometræ, and what appeared to be a small variety of *Sycœna Adonis*, taken near Croydon.—Mr. J. S. Baly communicated "Descriptions of a new Genusand of new Species of Halticinæ"; and Mr. Peter Cannon communicated "Descriptions of new Gennera and Species of Teuthredinidæ and Siricidæ, chiefly from the East Indies, in the collection of the British Museum."

GEOLOGICAL SOCIETY.

JUNE 21ST.—Prof. P. M. Duncan, President, in the chair.—Messrs. H. Maclean and S. Trickett were elected Fellows, and Dr. L. Rutimeyer, of Basle, a Foreign Correspondent.—The following communications were read:—"On the Ice-Fjords of North Greenland, and on the Formation of Fjords, Lakes, and Cirques in Norway and Greenland," by Mr. M. A. Helland,—"On the Drift of Brazil," by Mr. C. L. Morgan,—"Recent Glacial and Aqueous Action in Canada and the Drift-Uplands of the Province of Ontario," by the Rev. W. Bleasdell, —"On the Glacial Climate and the Polar Ice-cap," by Mr. J. J. Murphy,—"On the Discovery of Plants in the Lower Old Red Sandstone of the Neighbourhood of Callander," by Messrs. R. L. Jack and R. Etheridge, jun.—"On an adherent Form of Productus and a small Spiriferina from the Lower Carboniferous Limestone Group of the East of Scotland," by Mr. R. Etheridge, jun.,—"Notice of the Occurrence of Remains of a British Fossil Zeuglodon (*Z. Wanklyni*, Seeley) in the Barton Clay of the Hampshire Coast," "On the Remains of *Emys Hordwellensis*, from the Lower Hordwell Beds in the Hordwell Cliff, contained in the Woodwardian Museum of the University of Cambridge," "On an associated Series of Cervical and Dorsal Vertebræ of Polyptychodon from the Cambridge Upper Greensand, in the Woodwardian Museum of the University of Cambridge," "On *Crocodilus icenicus* (Seeley), a second and larger Species of Crocodile from the Cambridge Upper Greensand, contained in the Woodwardian Museum of the University of Cambridge," and "On *Macrurosaurus semnus* (Seeley), a long-tailed Animal with procœlous Vertebræ, from the Cambridge Upper Greensand, preserved in the Woodwardian Museum of the University of Cambridge," by Mr. H. G. Seeley,—"On the Mechanism of Production of Volcanic Dykes and on those of Monte Somma," by Mr. R. Mallet,—"On the Metamorphic Rocks surrounding the Land's End Mass of Granite," by Mr. S. Allport,—"On the Relation of the Upper Carboniferous Strata of Shropshire and Denbighshire to Beds usually described as Permian," by Mr. D. C. Davies, —"Notes on the Physical Geography and Geology of North Gippsland, Victoria," by Mr. A. W. Howitt,—"Further Notes on the Diamond Fields, &c., of South Africa," by Mr. E. J. Dunn,—"On Chesil Beach, Dorsetshire, and Cahore Shingle Beach, Co. Wexford," by Mr. G. H. Kinahan,—"Some recent Sections near Nottingham," by the Rev. A. Irving,—"On the Permians of the North-east of England, and their Relations to the under and over lying Formations," by Mr. E. Wilson,—"On the Section at High Force, Teesdale," by Mr. C. T. Clough, —"On the Distribution of Flint in the Chalk of Yorkshire," by Mr. J. R. Mortimer,—"On the Mode of Occurrence and Derivation of Beds of Drifted Coal near Corwen, North Wales," by Mr. D. Mackintosh,—"On the Cephalopoda-beds of Gloucester, Dorset, and Somerset," by Mr. J. Buckman, —and "On Evidence of the Subsidence of the Island of Guernsey," by Mr. R. A. Peacock.

GEOGRAPHICAL SOCIETY.

JUNE 26TH.—Sir R. Alcock, President, in the chair.—The following gentlemen were elected Fellows: Col. J. Doran, Lieut. V. L. Cameron, Lieut. J. J. Leverson, Lieut. G. Temple, Rev. W. T. Jones, Rev. J. P. Hobson, Rev. B. Wale, Messrs. H. J. Allen, E.

W. Berryman, H. G. Bevington, H. S. Bevington, E. Cooling, J. Forrest, R. G. Foster, J. Holmes, A. Lucas, H. B. Marshall, M. J. Parlane, J. Rideal, J. H. Stephenson, G. W. Vyse, and J. P. Bigg-Wither.—The papers read were, "Letter from General Stone (Cairo) on the Circumnavigation of the Albert Nyanza," by M. Gessi; "On the District of Akem, West Africa," by Captain J. S. Hay; "On the Geography of Eastern Turkestan," by Mr. R. B. Shaw.

METEOROLOGICAL SOCIETY.

JUNE 21ST.—Mr. H. S. Eaton, President, in the chair.—The following papers were read: "On the Climate of Scarborough," by Mr. F. Shaw. The thermometers used were placed in a louvre-boarded case, fixed to the north side of a wooden structure, having an open grass plot in front of them. The garden is about midway between the north and south sides of the town, and 150 yards from the shore; and as both residents and visitors are continually passing along this line, the observations may be taken as fairly representing the temperature of Scarborough as a watering-place. The mean monthly temperatures, based on the average of the past eight years, are, January, 38·8 ; February, 39·8°; March, 41·6°; April, 46·6; May, 50·5°; June, 55·9°; July, 60·4°; August, 58·9°; September, 55·1°; October, 48·2°; November, 42·2°; December, 39·0°. The mean for the year, 48·1°. The maximum temperature on any day in July, the warmest month, does not exceed on the average, 78·0°, the highest in the eight years being 85·5° in 1868. The mean of the extreme minimum temperature in the eight Januarys is 24·2°; the lowest being 13·3°, which occurred on January 1st, 1875. The annual rainfall, on the average of the past ten years, is 28·29 inches, which falls on 167 days.—"Notice of Upward Currents during the Formation and Passage of Cumulus and and Cumulo-stratus Clouds," by the Rev. J. Crompton. — "Suggestions on Certain Variations, Annual and Diurnal, in the Relation of the Barometric Gradient to the Force of the Wind," by the Rev. W. C. Ley. The author finds that the mean velocity of the wind, corresponding to each gradient, is much higher in summer than in winter. This is the case at all stations (though not equally), with all winds, with all lengths of values of radius of isobaric curvature, and with all values of actual barometric pressure. The general character of the mean diurnal variations of velocity, as these occur at the stations in the British Isles, may be fairly inferred from mean horary velocity curves, and may be thus described: At the inland stations, in summer, a slight increment of velocity occurs about midnight. This is succeeded by the morning minimum, which takes place in most of the months examined a little after sunrise. The mean velocity then rises until 1 P.M., when the diurnal maximum is sometimes attained. A slight subsidence then commonly occurs, but the mean velocity rises again at 3 or 4 P.M., and this second increment frequently forms the diurnal maximum. A great fall then takes place, which is more rapid than the rise in the morning, and the evening minimum, which is in most months the diurnal minimum, is attained about 10 P.M. The mean velocity at 1 P.M. is in fine and hot weather, more than double the 10 P.M. velocity in miles per hour, and exceeds the diurnal mean by about one-third. In winter the inflexions are very greatly modified. The midnight rise is not at in all months traceable, and the subsequent diminution is not very great. The morning maximum occurs about sunrise. The diurnal maximum takes place about 1 P.M., is less than double the minimum in miles per hour, and exceeds the mean of the day by about one-fifth only. —"Average Weekly Temperature of Thirty Years (1846-75) at Cardington," by Mr. J. M'Laren, and "De la Vulgarisation par la Presse des Observations Météorologiques," by M. H. Tarry.

FOREIGN SCIENCE.

We learn that the preparations for the Geographical Congress of Paris are actively pursued. The great map of France, executed by the officers of Etat-Major, all the parts of which have been put together so as to resemble an immense continuous sheet of paper, will be exhibited in the principal hall of the new Louvre. It will be reduced, and placed like a panorama. At the same time the Austrian Government has resolved to erect a new observatory in the neighbourhood of Trieste, provided with all the resources of modern science. Appeal has already been made to the talent of two of the best known English constructors, and the celebrated American optician, M. Clark, of Cambridge Port, has received the charge of a telescope of immense power.

The following is the programme of subjects for which prizes will be given in 1877, by the Royal Academy of Belgium.

The prizes will consist of gold medals of the value of 600 francs for the first and sixth question, 800 for the fourth and fifth, and 1,000 for the second and third. The particulars should be forwarded to M. Leagre, Perpetual Secretary of the Academy, at the Museum at Brussels, before the 1st of January, 1877. The subjeets are—

To give a resumé of the works which have appeared on theory of the *fractions continues* and to perfect it in some important point. To examine and discuss, while resting on new references, the perturbative causes which have an influence on the determination of electromotive force and of interior resistance of these two quantities for some of the principal batteries. To make new searches to establish the composition and mutual relations of the albuminous substances. To establish by observations and direct experiences the functions of the different anatomical elements of the *tiges* dicotyledonous, specially in what concerns the circulation of nutritive substances, and the use of fibres of leber. To determine if the germinative vesicle is to be found in the eggs which are developed without previous impregnation (by parthenogenesis) in the same manner as the eggs. To study the cycle of evolution of a group of the class of algæ.

In one of the numbers of *Les Mondes*, this month, M. Lekowski, by M. Resal, mentions an invention having reference to a system of distribution in steam engines, which appears to be worthy of the attention of engineers, but we feel that without a drawing, which is not given in *Les Mondes*, no correct idea of its details can be conveyed to our readers.

The nickel minerals of the colony of New Caledonia are thus spoken of by M. J. Garnier:—The nickel minerals of New Caledonia have become the subject of active investigation. It appears they are not arsenic sulphurs of nickel like those which have hitherto been utilized, but silicates of nickel and magnesia; and found in serpentine-shaped masses, being very abundant in different points of the island, and in association with euphotides, diorites, amphibolites, &c. Our readers will recollect this was the island to which M. H. Rochefort was transported. It is a colony capable of great mineral development, but the French do not go much beyond their lines, and the natives are as savage as the native New Zealanders. Our friends across the channel are, of course, not so superior in colonization as in science; this is a great misfortune, viewing their excellence in many of the branches of natural history. We believe that New Caledonia, in British hands, might become a gem—both as regards value and science.

Dr. Pelletan's "Microscope, its Employment and Applications," by Dr. Pelletan, published by Massen, is one of a series of very valuable works. The most recent volume of the series has only just arrived, a treatise on static electricity, by Muscart, Professor of Physics at the College of France. The volume extends to upwards of 600 pages. The various machines, such as Le Roy, Winter Nairn, Van Marum, are described and illustrated. This work is probably one of the fullest and most modern treatises we have. The price is 30s. for two volumes. The series runs about 16s. the volume. A remarkable work for its illustrations, which are not ordinary ones, but slips of silk, linen, serges, &c., in vivid blues, clarets, purples, and truly lovely violets, is "The Progress of Industry," in artificially coloured materials, by A. Wurtz, member of the Institute. We recommend it highly to manufacturers, inventors, &c. It is full of statistics, and a scientific account is given of the colouring matters in many instances. When so much attention is paid to perfection and *luxe* in male and female costume and festive decorations, we expect that a great number of the public will purchase this work. We cannot but again refer to the vivid colours. Messrs. Barthere, Cox, and Tindal sell the above works.

TECHNICAL EDUCATION, as a matter pertaining to the City Guilds of London, continues to make some little progress. The *Clothworkers' Company*, a wealthy body, still carries on its active patronage of the Yorkshire College for Science at Leeds, an institution for education in practical science, especially in reference to the cloth manufacture; and, according to the *City Press*, a proposition has been before that company to grant £1,000 towards the purchase of a site for the erection of a permanent college. The *Farriers' Company*, also, which is not, we believe, a rich corporation, according to the journal above named, has decided on offering prizes for an essay on the veterinary treatment and practical shoeing of horses. We should like to see these companies enrolling more members from practicians of the trades, but this does not appear to be much cared for; in fact, these bodies would appear rather to repress than facilitate the reception of members of the trade if strangers; for the *Stationers' Company*, a fair examplar comprising many stationer, printer, and book-trade members, has, it appears, recently issued a revised list of fees, wherein £3 10s. is named as the sum payable for entrance into the guild by patrimony (that is, when the person to be freed is the child of one who is or was free of the company, *without regard to his trade*), whilst admission to freedom of persons *in the trade* is to cost £25. Until men of practical knowledge of the art or trade come into these guilds in large numbers, we cannot hope for any great advance in promoting technical education. We hope our old friends of the *Turners' Company* will take heed to this, as well as to the promotion of technical education in turnery. It is all very well to get eminent men of science, politics, art, and literature into these guilds; but without the men of the trades they will never be permanently available for the advancement of technology; though at the same time caution ought to be exercised that the companies do not fall entirely into the hands of trade members, for then we fear that trade bigotry and exclusiveness would prove as great brawbacks to technical education and advancement as the present system is.

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SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

SESSION 1875-76 IS NOW TERMINATED.

TO MEMBERS OF COUNCIL.

Council meetings according to notices, which will be sent by post.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

The Session, 1875-1876, having terminated on 8th June last, there have been no meetings since that date. The proceedings on that day both at the Executive Council and Members' meetings, will be found reported in our last number (July, 1876).

The state of progress of the Lord Chancellor's Patent Law Amendment Bill has been carefully watched by the officers of the Institute, but although the Bill has several times appeared on the List of Orders of the House of Commons, the second reading has not taken place, and the public prints report that the Premier (Mr. Disraeli) announced its withdrawal. Notwithstanding this it was again on the List on the 24th July, but nothing was done in the matter. The Secretary of the Institute has received communications from other Societies on the subject, and has laid them before the Executive Council, but as its meeting was held on 27th July, we had to go to press before his report could be received.

Monthly Notices.

An Essay on Mine or Mining in Cornwall, is offered a prize by the Royal Geological Society of Cornwall, such essay to give a full description of the lodes, with their direction, underlie, and all the phenomena connected with their ore-producing characters.

Prof. A. C. Ramsay has recently resigned his chair of Geology in the Royal School of Mines, having occupied it since 1851. The Associates and students of the School have, it is reported, resolved, as a mark of their esteem, to present Prof. Ramsay with a testimonial.

School Board Compulsion to the Bitter End.—The Daily journals recently noticed the case of a man, residing within the London School Board jurisdiction, who committed suicide from fear of being again imprisoned, because he had a son who would play truant from school, for which unruly doing on the part of the son the father had been sent to prison by some *humane* Metropolitan magistrate. So in overwhelming fear of a second incarceration the disaster alluded to occurred. We do not wonder that a great many of the members of our London School Board are quaking with fear at the prospect of submitting themselves for re-election in November, when finings, imprisonments, and untimely death have marked their zeal without discretion system.

Marcus Ward's "Portable Atlas," in thirty quarto maps, answers general purposes of reference, though the colouring of the boundaries might be more exact. The European colonies are neither distinguished by colours or by letters of reference, but the outline of the maps is fairly correct. The "Home Atlas," published by the same firm, may be described as a cheap edition of the "Portable Atlas," whilst their Shilling and Sixpenny Atlases consist of selections from its maps. "It is to be regretted," says the *Athenæum*, and we agree with our contemporary "that English publishers, as a rule, do not entrust the compilation of their maps to scientific men, as is generally done abroad."

The awards by the Council of the Institution of Civil Engineers for original communications read at the ordinary Meetings during the session 1875-76, or printed in the Minutes of Proceedings, have just been announced. There were twenty-five meetings, when twenty papers were read, and three other selected papers have found a place in the Proceedings. In accordance with custom, a contribution from a Member of Council, Mr. H. Hayter, descriptive of the Holyhead New Harbour, was not considered in the adjudication of premiums. Fifteen out of the twenty-three communications have been rewarded. The Manby Premium, which it has been the practice to assign to some young engineer, has this year fallen to D. A. Stevenson, B.Sc., for his account of the Dhu Heartach Lighthouse. At the 19th students' supplemental meetings nine essays have been rewarded, and in one case a Miller Scholar's Cup of £40 has been awarded.

The British Association arrangements for the forthcoming meeting at Glasgow, at the meeting which took place at that city are as follows:—The Geological Exhibition will be accommodated in the Corporation Galleries, the Botanical in the Lower Queen's Rooms, and the Archæological in the University. Those will be large and complete, and arrangements have been made for keeping them open, if desired, for some time after the meeting of the Association. The local industries committee has three sub-committees on machinery, chemicals, and textile fabrics, and the materials for an exhibition are being collected, to be held in the Kelvingrove Museum, where there is already a general collection of considerable size and variety. A number of distinguished visitors have accepted invitations. Lieut. Cameron, and the Duke of Argyll, are expected to be present. Excursions are to take place on Saturday, the 9th, and Thursday, the 14th September, to Arran, Loch Lomond, Loch Fyne, Holy Loch, Coatbridge, and Paisley. Mr. R. B. Stewart has placed his yacht at the disposal of the Association for a dredging expedition, and Mr. Duncan, of Benmore, has done the same with his yacht, which is specially fitted for dredging purposes. It is intended that there shall be at least one dredging excursion to the Firth of Clyde or some other suitable place. A guide and hand-book is being prepared, under the general editorship of Dr. Blackie, and will contain notices of the various subjects of interest connected with Glasgow and the west of Scotland. In the University, all the Sections except two will meet, and reception and refreshment rooms are to be provided there. In addition to these premises, the City Hall and the Botanic Gardens Palace have been secured for the use of the Association. It is further proposed to have a concert by the Choral Union on Wednesday, the 14th of September. Meetings begin on the 6th.

Reviews.

"MAN."

"Man: Palæolithic, Neolithic, and several other Races, not Inconsistent with Scripture." By Nemo. Dublin: Hodges, Foster, and Co., Grafton-street. 1876.

Matters polemical have always been eschewed by the Scientific Review; still from time to time we have been compelled, by the prevailing rage for the consideration of the discoveries of science as regards their bearings on orthodox theology, to give some amount of attention to such questions.

The book before us is one dealing with a most important question, the reconcilement of the revelation of the Holy Scriptures as to the creation of man, and the mundane things around him, commonly termed the Mosaic Cosmogany, with the revelation of the rocks, afforded by geological investigations. The pages of this work afford us an interesting and lucid dissertation, in which the writer proceeds upon the theory that the "days" of the Mosaic history are stages or periods, and not literal days in our ordinary acceptation of the word; a line of argument which ought never to have been subject to so much opposition as it has been, seeing how often the word is used in the Scriptures to signify a given period or epoch, not a fixed number of hours.

As to these periods and the apportionment of the different creative acts of the Mosaic history, the author has his own views, and they will probably be understood by the following quotation:—

Referring to the work of the "second" day of the first chapter of Genesis he remarks, that we have no such guide to lead us to the great extent of the second day as we had to the length of the first, neither is it likely its duration was so extended. The time required to regulate the atmosphere and continue laying the foundations of the earth, and the filling the succeeding compartments with life, does not appear to have been so long as for the projection of a burning mass from the sun and fixing its course around the solar orb; the cooling of its heated surface; the lessening of its form; the reducing of it to order; and lastly, the introduction of the first germs of life into the inert mass, which the author considers was the creative process of our earth described as the work of the "first day" or period. Yet we have internal evidence from the workings of the second day that long ages and eons must have elapsed before the evening of that day arrived. The second day commenced with the Cambrian, and extended upwards through the Silurian, Devonian, and old red sandstone to the carboniferous series. (At the end of each chapter the author gives a list of the creations of the day mentioned in the chapter relating thereto), and he here remarks "that a few of the creations of the second day will be found in the several strata in which they occurred. Those few were new fresh creations, and do not appear in a previous strata. These are in number but trifling compared with the vast variety of the formations of each of those series, and are merely selected for the purpose of showing that the creative energy was untiring; there was no cessation, no pause in their production, but as old races and formations died out in the lapse of thousands, and it may have been millions, of years, others of new forms and races succeeded heap upon heap, lying at the sea bottom, until their united accumulations of the second day formed a mass of upwards of forty thousand feet in thickness."

It is not, however, as regards the investigation of the successive stages of creation narrated in that part of Genesis termed the First Chapter thereof which affords the author of this work scope for enunciating the distinctive views as to the creation of man, which may be considered the *raison d'etre* of the book, for the consideration of the Second Chapter of Genesis, and the *apparent* variation of the statements therein contained from those in the First Chapter, brings out the statement that the First Chapter of Genesis which records the creative work of the six days wherein the creation of man after the image of God (*Elohim*) is spoken of, points to the existance of races of men long since passed away termed *palæolithic* and *neolithic*. Whilst the Second Chapter of Genesis is the part of that book which relates to the creation of Adamic man, the progenitor of a race distinct from the *palæolithic* and *neolithic* races of mankind, which may have, however, to some extent commingled.

The work reviews many other statements in Genesis with ability and originality of thought. The following points are amongst the results:—

"That there were before the creation of Adam several creations of man, male and female. That instead of being the *first*, our Adam was the *last* created man. That after him there was a creation of domestic animals, and after them came Eve."

We consider that the work makes out a strong case in support of these views; but we think there is too much adherance to a literal view of the matter, and too little allowance for the poetical, figurative, and spiritual; and the meaning of Eloim is given as in the English translation of the Bible as the word *God* in the singular, without any statement in support thereof, although some scholars have objected to this rendering.

THE MOON.

"The Moon and the Conditions and Configuration of its Surface." By Edmund Neison, Fellow of the Royal Astronomical Society, &c., illustrated by Maps and Plates. London: Longmans, Green, and Co. 1876.

This is an elaborate and able treatise on Selenography in respect of the Moon, and is stated by its author to have been undertaken with the view of promoting the study of Selenography, by supplying what has long been much wanted—namely, a work on the Moon which should treat of the present condition of the surface and deal with the configurations of the lunar crust with some degree of comprehensiveness. English selenographers have long felt the want of such a treatise on the moon, and its absence has been often urged as a main cause of the slow progress that has been made in the study of the phenomena presented by the moon. Hitherto the only work on this subject has been Beer and Mädler's grand "Der Mond," published forty years back, and, being in German, practically inaccessible to most English astronomers, besides standing much in need of revision and extension to bring it up to date.

The "Mond" of Beer and Mädler having been universally accepted as the standard book on Selenography, has been taken as the basis of this, as it must be for long years of all future works on the subject; for no treatise can claim to be complete unless it incorporates the results of the seven years' observations of Mädler recorded in "Der Mond." As long as the present system of nomenclature remains in force, Mädler's names must also remain intact, for they have been too well established and too long in general usage to be now superseded.

Much information of interest and value has also been obtained from Mädler's predecessors, Schröter and Lohrmann, whose zealous labours are in general ignored by Beer and Mädler in their work. Many observations quoted by Schröter in his "Selenotopographische Fragmente" possess great interest even now, and promise to throw much light on lunar questions; and to a less degree the same is true of Lohrmann's observations. Attention has therefore been drawn to these points.

The greater portion of the material forming the present work, is, however, new, and has been mainly derived from eight years' constant selenographical observations. These were principally made with an excellent six-inch equatorial, of fine definition; but they have occasionally been made with refractors of smaller aperture, and towards the end with a nine and one-third inch With-Browning reflector of considerable excellence. These observations include a series of several hundred lunar sketches and drawings, which served as material for revising a considerable portion of the great lunar map of Beer and Mädler. For this purpose use has been also made of a collection of some hundred lunar sketches made of late years by different astronomers, and which from time to time have been sent to the author. These sketches have afforded information of great interest and value, which has been incorporated in the work. The author's thanks are especially due to the Rev. T. W. Webb for the general assistance he has received, and particularly for kindly placing at his service a long series of lunar observations. From this source much of great value has been derived.

As the work is primarily intended for the use of astronomers in the proper wide sense of the term, it has been thought unnecessary to introduce the consideration of the elements of general astronomy involved in the subject, or to enter into explanations of the meanings of the technical terms involved. A knowledge of the elements of general astronomy has throughout been pre-supposed, for this is invariably possessed by all working astronomers, even if not by all who take an interest in the science. After grave consideration, it has been decided to keep to what appeared to be recognised usage in regard to lunar nomenclature, and to sacrifice what must be held to be strict accuracy. This has seemed especially desirable in the case of the word "*terminator*," and the plural form of the term "*mare*." As before stated, every endeavour has been made to follow Beer and Mädler in their standard nomenclature.

In the work much attention has been given to the question of the probable nature of the lunar surface, and stress has been laid on the view advanced, that the constitution of the Earth and that of its satellite were primarily identical in nature. The view has also been strongly urged that the processes of modification their respective surfaces have undergone have been entirely analogous, and only modified in their results by the differences in physical dimensions between the two bodies.

Many considerations have also been adduced as showing strongly that the moon possesses a real atmosphere of great mass and greater magnitude, though of slight density; and it has been pointed out that to neglect this is to render nugatory all attempts to explain the phenomena presented by the moon.

The lunar map contains several thousand new objects not included in Beer and Mädler's "Mappa Selenographica," including many new rills not contained in Schmidt's great catalouge "Der Rillen auf dem Mond." Several systems of long winding valleys possessing an intimate connection with the lunar rills have also been delineated in so far as the scale of the map rendered possible.

In the final chapter a complete series of selenographical formulæ is given, for the purpose of enabling observers to carry out the numerous series of micrometrical measures that are required for the further progress of Selenography. To a certain extent elegance of form has been sacrificed to convenience in practice in framing these formulæ, and approximations have been freely introduced where they are perfectly admissible and where simplicity could be gained. As this chapter only professes to be a collection of formulæ, the deduction of the formulæ has in no case been given. With some few exceptions the formulæ are original, unless where it has been stated to be otherwise.

Throughout the chapter the same letter has been employed to denote one element, or possess one significance only.

THE MOON AND THE EARTH.

"The Moon and the Earth." Presidential Address. Liverpool Geological Society. Session 1875-6. By T. Mellard Reade, C.E., F.G.S., President of the Liverpool Geological Society. London: Hardwicke and Bogne, 192, Piccadilly.

Mr. Reade commences by referring to the late Sir Charles Lyell and his scientific labours, and he then proceeds to consider the cosmical theory to which geology leads us, directing attention to volcanic action as a matter of prime importance; he adds, without citing further instances,—it is quite clear that the earth is covered all over with signs of volcanic action, most of which is only disclosed to us by the denuding action of rain, rivers, and the sea. If we could pare off the crust of the earth, we should find them still more numerous, the roots of ancient volcanoes ramifying through the strata of various ages. Mr. Scrope, in his classic treatise on volcanoes, conceived in the truest geological spirit, states it has been variously estimated there are at the present time from 200 to 400 volcanic cones in existence, most of which are active, or have been within the historical age. Others, we know, have been denuded, and their remains buried among the sedimentary rocks, or entirely obscured by them.

It is perfectly clear that the whole of the present continents have been not once, but often, immersed beneath the sea, and (as is fair to assume, from the forms of the sea as displayed by soundings) that which is now sea has been not once, but often, dry land.

It is a well-established fact that the islands of the Pacific have formed, at one time or another, vast continents. This is proved, not only by their faunas and a consideration of the geographical distribution of animals, but by the known subsidence of the bed of the Pacific, first demonstrated by Darwin in his theory of coral atolls. Not only so, but the valleys and mountains now forming the bottom of the sea, disclosed by soundings in various parts of the world, bear the impress of their sub-aërial origin; their formation, in many cases, by rain, rivers, or ice. Again, the west coast of Ireland and Scotland, and the fiords of Norway, are further proofs of subsidence, the irregular coast line being formed by the partial submergence of valleys excavated by sub-aërial influences; and, in my opinion, the great trough, or valley, from the Cattegat to the North Cape, from 100 to 300 fathoms deep, following the coast of Norway and receiving these tributary valleys, is, in all probability, in its origin the same. To multiply instances would take up too much time; but I can refer you to my paper on the "Distribution of Land and Sea during the Glacial Period" for some further evidences.

If we consider that during the historical period Vesuvius and Etna have served as vents for the subterranean forces of Europe; that—excepting the blowing up and shivering of one cone and the building up of another within it, or the repetition of this on several occasions—the two mountains remain substantially now what they were at the time of our earliest records; that it is probable they have existed as vents, before this, for a length of time immense but difficult to estimate; and that the volcanoes in Iceland may not improbably have existed since the Tertiary era: we may form some conception of the time it has taken for the volcanic energies to have travelled over the whole surface of the globe. The distribution of volcanoes in time would prove an interesting and fruitful investigation, and throw considerable light on the history of Geology.

In the short space of this address, it has been impossible to give more than the salient features of the Geology of the Earth from the standpoint that I have chosen; but I trust that sufficient has been said to bring clearly to your minds the antithisis between the earth and its satellite, which I am now about to describe.

If now we turn our attention to the Physiography of the Moon, we find, from the admirable views and photographs of models made by Mr. Nasmyth of her surface, that the side which is turned towards us presents what has not inaptly been termed a Phlegreian field of volcanoes—so named from the *Campi Phlegræi*, the volcanic district about Naples. Instead of mountain ranges, valleys, and other irregularities such as we are familiar with on the Earth, we have the so-called lunar volcanoes in ring after ring, almost incalculable in numbers, and in sizes varying from a mile to 200 miles in diameter. This is usually considered indisputable evidence of long continued volcanic activity, such as, apparently, cannot be paralleled by anything we have experience of here. There is also this difference from the earth, *inactivity*, inasmuch as astronomers who have watched the moon say that the whole of her volcanoes are now extinct. There is also a decided general difference in the section of the rings to the volcanic cones existing on the earth.

After carefully passing in review the details of structure of the moon, comparing same with the structure of the earth, arguing that there are no seas or other waters in the moon, Mr. Reade thus concludes his address:—

The study of the lunar surface throws light upon the geology of the earth, and, by contrast, shows the correctness of geological reasoning on the subject of denudation. It also assists to prove the accuracy of Professor Ramsay's sections, even in opposition to so great an authority as Sir Roderick Murchison. There are, however, a wider set of inferences—mere suggestions, it is true, but, still, well worthy the attention of the philosopher no less than the geologist. It appears tolerably clear that the moon, in one sense, is a "spent" satellite—that her internal heat force is exhausted. Will it not, then, be said that this is a blow to the uniformitarianism of Lyell? Properly considered, I think not; for independently of the greater length of time it would take for a planet having the mass of the earth to cool, the conservative agencies of the water and atmosphere must not be lost sight of; the heat even of the volcano is not lost by radiation into space, for the steam imparts its heat to the clouds and atmosphere, and they again impart it to the earth in refreshing showers, while the sediments accumulating from age to age must act as a non-conducting envelope; while the sea remains a distributor of heat as well as material. The moon has "run down," but we cannot legitimately infer from that that the earth will do likewise—the conditions differ. Geology tells us that the earth has existed, in a condition differing little from what she is now in, for countless myriads of years; the process of "dying" is, at all events, very slow; and, what is pretty clear, if life does become extinct and our planet dead, it will be in a way differing vastly from that of the moon.

According to geologists, volcanic action is the conservative force which retains for us our continents; and were it to cease and the earth to become rigid and inflexible, denuding agencies would level both isle and continent, and the earth would become, not without form, and void, but one uninterrupted, monotonous sea; but life—aquatic life—might still exist, so long as the earth preserved the present rate of revolution on her axis, and the sun his present heat. These may all pass away; but to contemplate such a remote and ideal picture is pure speculation, hardly within the province of the essentially common sense science of geology.

Those who wish to have a general, yet accurate knowledge of this interesting subject will do well to carefully peruse this pamphlet.

"THE SECRET OF THE CIRCLE."

"The Secret of the Circle, its Area Ascertained." By Alick Carrick. London: Henry Sotheran and Co. 1876.

Any one who peruses this very interesting pamphlet will be impressed with the notion that we have yet surviving amongst us some of the alchemists and astrologers of old. And certainly the way the author is introduced to us in the prefatory notice by no means lessens this feeling. Mr. Playfair, a medical practitioner of Edinburgh, who it would seem became acquainted with our author in a professional way, thus describes the interview with him which led to his connection with this work:—

"Mr. Carrick was sitting in his arm-chair, and he slowly raised his head as I entered, and looked round. He was dressed in a black cloth dressing-gown, and black velvet close-fitting cap, and his feet and lower parts of his legs were swathed in wrappings, resting on a red cushion, which was partly reflected on the well-polished floor. A bright light from the open window, looking into the north back of the Canongate, fell full upon his face, and made the few grey hairs that strayed about his temples glisten like threads of silver. His hands were white and thin, and, though not perhaps discerned at the moment, I had noticed this and their smoothness and thin blue veins before. But his eyes! As they steadfastly looked at one there seemed a power in their light to make one purer and better, and which—I don't know how it was—seldom failed, when looked into, to stir into existence the finer feelings of one's nature. They were large, bright, and clear, as those of beautiful and healthful youth, of very light blue; but the expression—the depth of discerning intelligence and intellect, as if a pure and master-mind shone through them, was beyond any words of mine to describe."

After some preliminary conversation the manuscript of the present work becomes the topic of coversation, and Mr. Carrick says, "'I mentioned, sir, before, that I gave Miss M——' (a lady who made herself very useful at the Infirmary and elsewhere amongst the poor), 'the manuscript I have before spoken to you about. You are a friend and relative or connection of hers, and I have asked her, and she has consented, with your assistance, to undertake the printing and publishing of it.—I have told her, and now tell you, that any proceeds that may be realized from it are to be hers, to do what she wills with. I gave her ten pounds to defray the cost, which I thought should suffice.—I would like it to be done in London, at the Chiswick Press. I lived there once.—I received much of my education there.—Will you assist me in this, and see it done as well as it can be; particularly the plates, the paper, and type, and anything else that may occur to you?'—I promised to do my best, saying, however, I did not know much, if anything, of such matters."

Further on we are informed that our author presented Mr. Playfair with a little box saying, "'Mr. Playfair, you will please accept this, which I have cherished and valued highly. It has been for some hundreds of years in the possession of a branch of the family of the Bruce, to which you know I am nearly related. The tradition is that it was found, together with the celebrated Eastern-Stone, at Dun-Ban-rey in Selma and taken thence to Dunstaffnage Castle. The Coronation Stone was afterwards, as you no doubt know, moved to Scone, whence it was taken to England by Edward I.' He took a piece apparently of paper from a small ivory box, snuff-coloured with age, and, unwinding it with trembling hands, something rolled out about the size of a pigeon's egg, and fell on the table with a sharp, hard sound. I saw that it glittered and sparkled as it turned over, and was of a beautiful deep green. 'Look at the gold plate set in the lid of this box. It is very exquisitely fashioned and chased, but that is not the most interesting matter connected with it. These are Arabic characters, and the words, as nearly as I can translate them, are—

> 'There is One God of Earth and Heaven
> In the □ are like parts Seven,
> Four more to the ○ given,
> The Sum of all alike Eleven.'

This stone, which is also engraved with Arabic characters, is an emerald, uncut, except as you see on one face.' (It was set in a massive chased gold ring of curious pattern.) 'The device which is cut on this stone—which is without a flaw—is a circle, and inscribed square, and on each segment formed by the square, from right to left the words, Wisdom, Knowledge, Love, Truth, and along the diagonal of the square the word Seven.—Take it and keep it with the box for my sake. It is a singular and beautiful stone.—Nearly two thousand years ago wise men came from the East of Jerusalem, learned men, sir, not soothsayers or magicians, but "wise men," called to do homage to and "worship" the Son of God, conceived by the Holy Ghost and brought into this world by a VIRGIN. They were guided by a miraculous star that evidently led them—as the pillar of fire did the Israelites—and which stopped in its course, and, in the language of this holy book, "stood over where the young child was." Yes, they were wise men and divinely honoured on earth. Where they came from is not known. I have long thought they came from Hadramaut—the happy land of incense, where they worshipped Al-Semed—the sphere—a land described by poets, and not without reason, in such glowing colours—

> "———sit dives amomo,
> Cinnamaque, costumque suam, sudataque ligno
> Thura ferat, floresque alios Panchaïa tellus;
> Dum ferat et Myrrham."

It would be impossible to give a true idea of the author's theory without quoting the larger portion of the work, and illustrating same with the illustrative diagrams. We shall, therefore, present our readers with what may be called his summing up of the reasoning on which his demonstration is founded.

"The circle itself is a plane figure, the outermost portion of which is a contiguous succession of the smallest particles equally distant from a centre.

"If this be true, it will be said, it does not in the least lessen the difficulty with which we have to deal, but rather increases it, as what has been said only serves to show the almost illimitable minuteness of the parts of the matter of which the circle is composed. It need not, however, appal us or make us despair of measuring the circumference; let us look at a measurable figure, the inscribed square. This square, of which we know the area, contains within its ambit just what we have been supposing the circle should contain within its ambit, the largest number of atoms that can be contained within such ambit boundary or perimeter, and the four lines without breadth which describe it proceed from atom to atom here just as in the circle, the sole difference being that the atoms are differently marshalled or arranged. If the square were a square composed of cannon balls, billiard balls, small shot, or grains of sand, these would not be the ambit or boundary of the square, but the imaginary straight lines without breath, which spanning these would compass and include them and the smallest created atoms that could lie between. These straight lines forming the square or its ambit can be divided and subdivided until the number of such lines equals for the same length the number of lines in so much of the polygon of most sides. This subdivision cannot be carried beyond a certain point or *ad infinitum*, as was thoroughly understood and clearly expressed by Euclid. A curve is a succession of smallest straight lines deviating from and never constituting a longer straight one. In considering a great number of the manifold figures which may be described in the circle, the crescents formed in it by describing two segments of a circle twice the size—such segments being each twice the size of the segments described in the circle by its inscribed square—a diameter of the circle being the chord subtending the two (which face to face form an ellipse),—attracted attention. It was soon seen that these crescents, afterwards found to be the *Lunula* of Hippocrates—or, as is more probable, of Oenopides—contained the same area as the inscribed square. In a word, this simply means that, the two larger segments being of a circle double the size and equal to the four smaller ones described by the inscribed square, what remains of the circle is evidently equal to its square. Another curvilinear figure with the noticeable feature that its *length of boundary line or ambit is equal to the circumference*—half the circumference being divided into two lengths and inverted or transposed—was also seen to contain the area of the square. These curvilinear figures and another containing the area of the dodecagon, or square and half square, which is its exact area, might, it was observed, be divided and subdivided, and their parts transposed in almost numberless ways, so as to produce a great variety of antic figures each known to contain the area of the square, the area of the dodecagon, or some portion of such areas, but of little value in themselves, as such figures have an answering or corresponding concavity to their convexity, which defeats any absolute quadrature of the entire circle, and leads very frequently on inadequate attention to little else than a series of paralogisms. Such figures, however, have been treated with unmerited contempt; they exist and have a value of their own if they only suggest, in the least indicative and most shadowy way, that curve lines for all purposes of measurement are equivalent to straight ones, inasmuch as they may be described to measure a known measurable area, and are indeed only the largest number of straight ones that can be in such length. If they do not help us in any way to the true measurement of the circumference, they enable us (considered in a particular light), at least better to appreciate the true nature of a curve. Bounded by the same ambit as the circle containing an area as much less than the area of the inscribed square as the area of the square of the circle's diameter is more than that circle, which with the same ambit as the circle contains the same area as the inscribed square. Such in substance were some of the conclusions my early cogitations on this subject led to."

These conclusions are the basis of Mr. Carrick's theory.

REICHENBACH ON MR. CROOKES' MECHANICAL ACTION OF LIGHT.

"The Mechanical Action of Light, by Dr. Crookes, F.R.S., &c., and Former Speculations." By O. REICHENBACH. London: Printed by Taylor and Francis, Red Lion-court, Fleet-street. 1876.

IT is very difficult to convey a true view of the contents of this pamphlet without presenting our readers with the whole work, but we may perhaps succeed in conveying some general notions as to its contents, which, as we read it, relates to Professor Stewart's theory of æther, supported by Mr. Crookes in his work on Mechanical Action of Light, the existence of which, the author says, the professor tried to prove by an apparatus consisting in a disk of aluminium made to turn with great rapidity in *vacuo*. By means of a thermo-electric pile it is proved that heat is generated; and the whole, or almost all, of this heat is ascribed to the presence of "æther" which fills the vacuum in the receiver after the air has been pumped out; if by infiltration, or as residuum, or in whatever manner, was left to the "consideration" of the looker on.

There, again (says Mr. Reichenbach), was to be regretted the omission of the necessary precise definition of "æther." If what remains under the pump after the air has been exhausted is material, it is matter, it is grave, it has physical and chemical atom. This atom may be infinitely less dense and weighty than that of hydrogen; but it must be a substance accessible to physical and chemical tests, proving or disproving its presence. So far the existence of this substance, universally present in an isolated form, uncombined with known substances, is not indicated by any tests; and if the existence were finally proved by such tests, it would remain uncertain if the atoms touched or were themselves separated by vacuum, and nothing would have been found but a body, increasing the number of chemical bodies, traceable by weight, with a very peculiar chemical nature, with an aversion to all combination, which, however, should render it physically very easily discernable. But such a body would not be the mystic thing hunted after, it would not be any more mystic than any other body, and would not bring the problems to be solved by "æther" any nearer their solution.

In the experiment of Professor Stewart there is not the slightest indication that such a new body remains when the air has been pumped out. It is also against all analogy that the most permeable, least dense substance should be isolated from the air by pumping, and should remain, like pebbles at the bottom of a well. No test proves the existence of such a residuum within the glass; and, if it is pumped out, certainly it cannot flow in, after the air has been pumped out, through the glass from the outside air; for the little air remaining is quite like the air pumped out in every physical and chemical quality. The former shall also not be able to produce by friction the heating of the turning disk; but the "æther" which is not traceable by weight and chemistry, shall have such a power: that is certainly not logical.

There is nothing left but to suppose that Professor Stewart, and the school, consider "æther" an "immaterial agent," *all their assertions to the contrary notwithstanding*. I have already defied science to give me a concrete idea of "an immaterial agent;' and I maintain it is unscientific to say that a thing having no quality in common with another shall exercise any influence or power over it. An immaterial agent is a word instead of a conception; it is an undefinable something. Man divests matter of all functions of materiality, as he imagines, and then partly readmits them in his mind in a hazy somnambulist state. He has satisfied his mystic instincts; the *horror vacui*, and the desire to explain what he cannot yet explain, are appeased.

If Professor Stewart substituted for the glass receiver one of some heavy metal, the condition of the "æther" remaining, according to his theory, under the receiver could not thereby be affected. If, then, the heat produced should be the same as in the former case, the proof would not be conclusive for the "æther" if we ascribe the heating either to the remaining air, or to the friction of the spindle, or to a tension and movement of the particles of the disk in consequence of rotation and of the ensuing centrifugal tendency, certainly all productive of heat. But if the heat were greater, the proof would be conclusive against the "æther;" I do not mean against the existence of diffuse matter of unknown material properties dispersed and grouped in celestial spaces, but against the mystic "æther," "the agent" of Newton, and in favour of my theory, being substantially the view Newton declares "absurd."

Every smallest particle has an individual existence, and therefore the possibility of an individual movement. Let *a* be a particle at the surface of the disk, and *b* the nearest particle of the receiver or pile. When the disk begins to turn, the connection which exists between them by their mutual attraction is altered, it is forcibly diminished by their increasing distance; but by their tendency of retaining each other they are put into an individual motion. In the same manner a repulsion is produced for each particle by the particles to which it is brought nearer, or in respect to which the mutual attraction increases by the diminution of distance. In this way a reciprocal movement is impressed on the particles of the disk and of the receiver. A closer examination of this movement shows it to be a tendency of rotation round an axis for every individual particle or atom; this tendency or vibration is heat. In consequence of it the quantity of each atom descends from its polar axis (its axis of rotation) towards its equator; its centrifugality increases, whereby the mutual repulsion of atoms increases, and therefore the volume of the mass to which they belong. The polar movements in this way produced in and amongst the atoms constitute electricity.

The heat produced may be not improperly called induced by gravity, gravity taking effect through the vacuum without any intermediate agent, and setting the atoms into individual motion, constituting heat.

After stating some propositions he would maintain, the author adds:—

The professor yields to a love for mysterious light over more palpable heat, without having first determined what they have in common, in origin and action, and what share therefore belongs to each in the experiment. In the accidental observation which led the speculative mind of Mr. Crookes to his experiments, light played no part.

It is speculative predilection when Mr. Crookes says, "I long ago gave up metallic instruments, owing to their erratic movements while radiating or absorbing heat," instead of first ascertaining the cause of this erratic distinction. He has been so prevented from ascertaining if apparently equal amounts of light from various sources produce precisely the same effects, or, to speak with him, if a like beam of equally coloured light always weighs alike. He has not examined if the same beam produces the same effect on all substances placed in like conditions, weighs alike in different scales. He has not pursued with equal zeal the inquiry, What is the cause of the opposite effect of warm and cold on the motion of the radiometer, of right and left-handed revolution, of repulsion and attraction? He has therefore as yet not examined, if and where exist, under otherwise equal conditions, for each substance a limit temperature separating its warmth from its coldness. He has been prevented from inquiring if light, demonstrated as distinct from heat in its motion, does not then also produce a double rotation, if it does not present dark cold rays at one end of the spectrum as it does warm rays at the other, becoming both ways congruent with temperature,—a question to be followed by more questions, &c., &c., &c.

REICHENBACH'S PLANETS BEYOND NEPTUNE.

"Two Planets Beyond Neptune, and the Motion of the Solar System. A Speculation. By O. Reichenbach. London: Wertheimer, Lea, and Co.

The following quotations from this pamphlet will convey a general idea of its contents:—

"Mathematics predicted the existence of Neptune; speculation reveals two great planets beyond.

"If we can read the history of our solar system from what we see, we will also learn if what we know is the whole of the system.

"Not all nebulæ may be resolved into stars. An uniform mass of smallest particles is born from the conflagration of systems. Placed between unequal opposing forces it becomes pregnant with shaping motion. All forces are mutually convertible, sprung from gravity; matter.

"Any force acts unequally at unequal distances; it produces motion within a general motion.

"In the nebula from which we came, two motions met; they divided the nebula into the solar and planetary portions S and P.

"As the two external impelling powers determined the size of germs and the direction of their motion, their fractions must be in inverse proportion with their individual motions.

"S and P separated when the uniform nebula received motions giving two particles—germs—different velocities of rotation in the same sense. Long ago I showed heat to be rotation."

The author enters fully into the *rationale* of these propositions, and then states:—

"Having already published in 1857 the manner and order in which P parted from S and became divided in itself, I conclude with some general remarks.

"As the effect of one mass varied within the extent of the other pressure, density and motion had to differ within each mass. Each mass embraced solid, liquid and gas, the portions in the two first states, and again in the first one, increasing in the average. All changes proceeded gradually.

"The eccentricity of orbits being closely connected with the proportions of masses in various states, this eccentricity, and that of the masses themselves, had to change with the proportion of these quantities.

"Figures like those given for the centrifugality of the incipient S and P are only summary expressions for a mechanical history, connecting past and present.

"When P moves from S and refrigeration commences after the greatest absorption of heat—nebula precipitates on the nucleus, interior attraction increasing in P, when that of S on P and on its exterior parts diminishes. The average density of P falls within closer extremes; the solid increases at the expense of the liquid, the liquid at that of the gas; the gas itself becomes more dense and more uniform as to day and night variation. When P and S draw nearer, every thing is reversed; individual rotation of particles is increased and set at liberty at the converted sides of S and P, and the mutual attraction of the two masses alters their individual attractions.

"P and S condense gradually as they go from and to each otber. When, after a series of oscillations, P returns, in its most eccentric orbit, towards S, and liquid rings, precipitated vapours, have cut deeply into the condensing solid, then commences, by the dissolving and compressing action of S, a higher mutual reaction of bodies in various states of association. The external liquid and gas, their rings, move against the relatively increased velocity of rotation and transport of the solids.

"Accumulated centrifugality—latent heat—contends against accumulated attraction—cold; the forces of S and P enter in opposition against their own creations. P divides and sub-divides, each part having its share of solid, liquid and gas. These parts, carried in different directions with different velocities, describe orbits of various extents. But order reigns in these revolutions."

After giving calculations as to the elements of two unknown planets, the author adds:—

"Soon after the discovery of Neptune, Professor Leverrier inferred from his preceding calculations that something remained to be found. He now thinks differently; why?

"He assigned the perturbations Uranus experienced from 1817 to 1847 to a planet with a mass of $\frac{1}{9300}$ and at 35·40 to 37·90 terrestrial distances from the sun. The Struve's made the mass of Neptune $\frac{1}{14480}$ Why Professor Newcomb lowered it to $\frac{1}{19700}$ is intelligible under the hypothesis which follows. He deducted a mass of $\frac{1}{19380}$ from the observation of the satellite of Neptune; but this is hardly conclusive, when we see how far his observations of the moons of Uranus, which is so much nearer, differ from those of Herschel, on which he yet relied with regard to two of these moons.

"Speculation finds Neptune 0·61 and B 0·39 of their united mass. The influence of Neptune and B, when both culminate with Uranus, will affect the latter like a planet with a mass equal to theirs and 35·8 distant from S.

"Leverrier found the eccentricity of the unknown planet 0·107; the effect of Neptune divided by that of B, each at its maximum is 0·111.

"From 1817 to 1847 Uranus moved from 246° to 15° and Neptune from 243° to 328°; from this we might infer that B moved from 272° to 289° and is now about 305°. The influence of A must have been small from 1817 to 1847, and we may assume it was at 158° in 1847, or at present about 195°. But these figures admit of a wide margin, particularly if B was in advance of Neptune in 1847.

"Uranus has been seen in 1690. The observation of that time has not been fitted into the later course. If the positions were in 1847 as suggested, Uranus was in 1690 at 64°, Neptune at 348°, A at 313°, B at 207°; A having a mass almost double that of B, and at the nearest from Uranus a distance not one-half that of B, had therefore in 1690 exchanged places with B with regard to Uranus and Neptune."

The motion of the solar system is treated of by a connected chain of mathematical calculation, which we must refrain from transferring to our pages. As to these calculations the author says:—

"The following numbers, partly differing from those given in 1857, may themselves contain errors, but the evidence for the hypothesis in general is improved.

"Gravity must bring together what heat does not keep asunder.

"There can be no empty space out of proportion with the arrangements and motions of matter."

Cassell's Dictionary of Cookery.--This very useful work progresses most favourably. It is really an important addition to the literature of our daily life, and supplies information useful for the *recherché cuisine* and in the household of persons of moderate means.

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